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ABSTRACT

The purpose of this research was to estimate the educational production functions for students belonging to different subgroups in a principles of economics course. Three samples were used: (1) a large lecture class at a large state university (185 students), (2) several small sections taught by different instructors at a small private university (149 students), and (3) two sections taught by one instructor at a small private university (66 students). The three groups were disaggregated on the basis of sex of the student, age of the student, the student's score on a pretest (preTUCE), the student's pre-attitude toward economics, and the student's ability as measured by American College Test (A.C.T.) scores. Ordinary least square regression analysis was used to estimate the production function for each group and an F test was used to test for group differences. Results indicate that there was no difference in the set of coefficients for the production function when the sample was disaggregated by sex or age. However, a significant difference was indicated when the sample was disaggregated by preTUCE or A.C.T. scores. A test of coefficients of the disaggregated regressions showed that teachers have different effects on low, average, and high ability students. These results indicate that students with different levels of preknowledge or different ability levels utilize their individual attributes in different ways in order to learn. Findings suggest that students of different ability levels might learn more if separated and taught by different pedagogical methods and instructors. Over 25 data tables are provided. (Author/LH)

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DISAGGREGATION OF STUDENT ACHIEVEMENT IN THE PRINCIPLES OF ECONOMICS COURSE: REVISED

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Jerry Manahan*

American Economic Association
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Revised version of an earlier paper presented at the Annual Meeting of the Midwest Economic Association (48th, Chicago, IL, April 5-7, 1984).

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ABSTRACT

Disaggregation of Student Achievement
in the Principles of Economics Course: Revised

The purpose of this research is to estimate the educational production functions for students belonging to different subgroups in the principles of economics course. Three samples are utilized. The first is a large lecture class at a large state university, the second sample consists of several small sections taught by three different instructors at a small private university, and the third sample consists of two sections taught by one instructor at a medium size state university. The three groups are aggregated and then the sample is disaggregated into various subgroups based on five different criteria: sex of the student, age of the student, the student's score on a pretest (preTUCE), the student's pre-attitude toward economics and the student's ability as measured by their A.C.T. score.

Ordinary Least Square regression analysis is used to estimate the production function for each group and an F test is used to test for group differences. Four variations of the following learning model are utilized in this research.

Achievement = f(Ability, Attitude, Effort, Quality of Instruction, Socioeconomic Variables)

The results indicate that there is no difference in the set of coefficients for the production function when the

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sample is disaggregated by sex or age. One model indicates a difference when the sample is disaggregated by pre-attitude but the other models do not. All models indicate a significant difference in the coefficients of the production function when the sample is disaggregated by preTUCE or A.C.T. scores. A t test of the coefficients of the disaggregated regressions indicates that the teachers have different effects on low, average and high ability students. These results indicate that students with different levels of preknowledge or different ability levels utilize their individual attributes in different ways in order to learn. The results suggest that students of different ability levels might learn more if separated and taught by different pedigogical methods and instructors.

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Disaggregation of Student Achievement
in the Principles of Economics Course: Revised

INTRODUCTION

In an American Economic Review article Hansen-Kelley-Weisbrod (1970 365) asserted that different types of students, as defined by previous academic performance and other variables might receive different benefits from an economics course depending upon the course content and the instructional technique. This assertion has received little attention in economic education research. Allison (1982) disaggregated the student population by ability and concluded that bright instructors and problem sets are more useful to bright students. Self paced instruction was more useful to weaker students and classes aimed at too high a cognitive level were discouraging for the weaker students. On the issue of sex differences, Allison concluded that female students have a lower marginal product per hour of study time than male students and that the males start and end the course with a greater stock of knowledge.

Henry and Ramsett (1978) also disaggregated a sample by student ability using ACT scores and concluded that the factors influencing the learning of low ability students were quite different from those for average or high ability students. However, they did not compute an F test to compare

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the different sets of coefficients and one of their equations was insignificant.

Swartz, Davisson and Bonello (1980) disaggregated their sample using six different measures of ability or knowledge. They concluded that computer assisted instruction (CAI) was beneficial to the weaker students but not for average or bright students. Their conclusions are questionable since their model contained only the CAI variable and several measures of ability or knowledge. They also failed to use an F test for the difference in the sets of regression coefficients. Instead they looked at the significance of variables in the regression equations.

Yates (1981) and Becker (1983) repeated the plea for additional research using disaggregated data. This research is an attempt to fill part of this void.

Results and Conclusions

This study combines three data sets and then disaggregates the data by the sex of the student, the student's previous knowledge of economics, the student's ability as measured by their A.C.T. score, the student's attitude toward economics and the age of the student. The disaggregations are made at points one standard deviation above and below the mean except for age which is disaggregated into two groups, one for students twenty years and under and

the other for students over twenty years of age. An F test is used to test the sets of regression coefficients for the separate samples in order to justify pooling the data. The sets of coefficients for the separate data sets are significantly different (F=10.61) and thus should not be pooled. However, Hanushek (1977) argues that this hypothesis test is too rigid and that when one is interested in pooling the data one should use a lower level of acceptance. Therefore, the data are pooled in spite of the unacceptable F test.

TABLE ONE

Disaggregation by Sex of Student

When the sample is disaggregated by the sex of the student, there is no significant difference between the sets of coefficients for the male and female students (F=.77). This result applies to all four models as shown in table two below and table two in appendices C, D, and E. These results affirm earlier results obtained by Manahan (1984).

TABLE TWO

Disaggregation by PreTUCE Score

When the sample is disaggregated by the preTUCE score of the student there is a significant difference among the sets

TABLE ONE

Comparison of Three Subsamples

Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	University One (2)	University Two (3)	University Three (4)
PreTUCE	.17 (.06)**	.14 (.08)*	.36 (.11)**	-.08 (.07)
Posexgr	1.10 (.31)**	1.18 (.38)**	2.09 (.57)**	1.36 (.77)*
Sex	.21 (.40)	.11 (.51)	.54 (.68)	-1.29 (1.04)
CACT	.40 (.05)**	.29 (.06)**	.33 (.09)**	.55 (.12)**
Age	.03 (.01)**	.02 (.02)	.02 (.02)	.06 (.02)**
Posat	.09 (.03)**	.06 (.03)*	.06 (.46)	.04 (.07)
Constant	-6.68 (NA)	-2.17 (NA)	-6.58 (NA)	-13.21 (NA)
$\bar{R}^2$	.42	.38	.51	.41
F	49.44**	20.0**	26.47**	8.40**
SSE	5530	1830	1975	819
n	400	185	149	66
F Test	F = 10.61** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE TWO

Comparison by Sex of Student
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	Total Sample (2)	Males (3)	Females (4)
PreTUCE	.21 (.06)**	.21 (.06)**	.20 (.07)**	.21 (.10)*
Posexgr	1.55 (.30)**	1.55 (.30)**	1.45 (.38)**	1.67 (.48)**
Teacher1	3.47 (.52)**	3.47 (.52)**	4.05 (.65)**	2.40 (.86)**
Teacher2	1.48 (.57)*	1.48 (.57)*	1.84 (.74)*	1.01 (.91)
Teacher3	3.97 (.70)**	3.97 (.70)**	3.75 (.80)**	5.09 (1.47)**
Sex	.02 (.38)	--	--	--
CACT	.34 (.05)**	.35 (.05)**	.32 (.06)**	.38 (.07)**
Age	.03 (.01)**	.03 (.01)**	.05 (.02)**	.02 (.01)*
Posat	.06 (.03)*	.06 (.03)*	.05 (.03)	.07 (.04)*
Rtuce	-.78 (.68)	-.78 (.68)	-2.00 (.94)*	.21 (1.04)
Constant	-7.20 (NA)	-7.20 (NA)	-11.24 (NA)	-7.07 (NA)
$\bar{R}^2$	.50	.50	.46	.52
F	40.92**	45.59**	24.39**	19.49**
SSE	4729	4729	2872	1750
n	400	400	244	156

F Test F = .77 (The coefficients are not significantly different)

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

of coefficients for the production function (F=3.74). Further examination of the coefficients indicates that the coefficients of the teacher2 variable are significantly different when subjected to a t test (t=2.80 for low versus high preTUCE and t=2.43 for average versus high preTUCE).[2] On the TUCEchg and TUCEgap models the coefficients for Teacher1 and Teacher2 are significantly different between the high and low preTUCE groups. On some models (appendices C and D) the coefficients on the Rtuce variable are also significantly different. However this difference could be due to some unknown factors, since the Rtuce variable is not well defined.

These results indicate that the teacher may have a different influence on students with high knowledge of the subject at the beginning of the course than on students with low knowledge of the subject at the beginning of the course. Note that Teacher2 has a negative effect on low preTUCE score students and a large positive influence on high preTUCE score students.

TABLE THREE

Disaggregation by CACT Score

Disaggregating the sample by C.A.C.T. scores indicates that the sets of coefficients of the production function are significantly different for low average, and high ACT score

TABLE THREE

Comparison by PreTUCE Scores
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	PreTUCE (Less than 8) (2)	PreTUCE (8 to 13) (3)	PreTUCE (Greater than 13) (4)
Posexgr	1.73 (.30)**	2.09 (.93)*	1.71 (.37)**	.58 (.52)
Teacher1	3.35 (.52)**	1.15 (1.41)	3.77 (.64)**	4.67 (.99)**
Teacher2	1.36 (.58)*	-.62 (1.41)	1.20 (.73)	4.24 (1.02)**
Teacher3	3.80 (.70)**	2.07 (1.89)	4.39 (.84)**	2.51 (1.55)
Sex	.14 (.38)	-.80 (.98)	.26 (.47)	-.40 (.78)
CACT	.38 (.04)**	.28 (.13)*	.33 (.06)**	.46 (.09)**
Age	.03 (.01)**	-.03 (.05)	.03 (.01)**	.03 (.01)**
Posat	.06 (.03)**	.07 (.07)	.04 (.03)	.12 (.05)**
Rtuce	-.80 (.69)	-.30 (1.78)	-.06 (.85)	-4.12 (1.49)**
Constant	-7.07 (NA)	7.35 (NA)	-5.62 (NA)	-5.86 (NA)
$\bar{R}^2$	.49	.32	.41	.71
F	42.90**	3.75**	22.89**	17.82**
SSE	4877	511	3579	339
n	400	55	282	63
F Test	F = 3.74** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

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students (f=7.16). All four models demonstrate this result. When a t test of the coefficients is performed the differences are again the coefficients of the teacher variables. The Rtuce variable also has a significant t for three of the models. This result reinforces the earlier results from disaggregating by PreTUCE. The teacher has a different influence on high, average and low ability students.

TABLE FOUR

Disaggregation by Pre-attitude Score

When the sample is disaggregated by the student's pre-attitude score only the first model indicates a significant difference in the sets of coefficients for the production function (F=1.96). This is the only model containing the post-attitude score and the t test shows that the coefficient for the low pre-attitude students is significantly different than the coefficient for the average pre-attitude students. Thus a poor attitude towards economics at the beginning of the course may influence achievement. This result deserves further attention in a simultaneous equation model.[3]

TABLE FIVE

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TABLE FOUR

Comparison by C.A.C.T. Scores
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	C.A.C.T. (Less than 16) (2)	C.A.C.T. (16 to 25) (3)	C.A.C.T. (Greater than 25) (4)
PreTUCE	.31 (.06)**	.19 (.16)	.20 (.08)**	.54 (.13)**
Posexgr	2.49 (.29)**	2.53 (.65)**	1.39 (.39)**	2.32 (.64)**
Teacher1	4.24 (.54)**	1.27 (1.88)	3.94 (.63)**	4.10 (1.10)**
Teacher2	2.19 (.60)**	1.94 (2.20)	.58 (.72)	4.47 (1.10)**
Teacher3	3.91 (.75)**	2.21 (1.45)	5.06 (.91)**	3.21 (1.76)
Sex	.37 (.40)	.60 (.93)	.12 (.49)	-1.19 (.93)
Age	.02 (.01)*	.07 (.02)**	.02 (.01)*	.02 (.02)
Posat	.04 (.03)	.01 (.06)	.07 (.03)*	.07 (.08)
Rtuce	-1.8 (.71)*	-2.66 (2.21)	.30 (.86)	-4.97 (1.81)**
Constant	-1.62 (NA)	-11.28 (NA)	1.61 (NA)	2.85 (NA)
$\bar{R}^2$	.43	.31	.31	.53
F	33.76**	4.47**	14.19**	8.45**
SSE	5455	697	3407	467
n	400	70	269	61
F Test	F = 7.16** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE FIVE

Comparison by Pre-attitude Scores
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	Pre-attitude (Less than 43) (2)	Pre-attitude (43 to 54) (3)	Pre-attitude (Greater than 54) (4)
PreTUCE	.21 (.06)**	-.10 (.15)	.26 (.08)**	.22 (.16)
Posexgr	1.55 (.30)**	1.86 (.88)*	1.26 (.35)**	1.85 (.87)*
Teacher1	3.47 (.52)**	3.29 (1.54)*	3.81 (.61)**	2.06 (1.44)
Teacher2	1.48 (.57)*	1.57 (2.20)	1.39 (.63)*	2.98 (2.16)
Teacher3	3.97 (.70)**	4.19 (1.63)*	4.03 (.84)**	4.40 (2.14)*
Sex	.02 (.38)	.80 (1.07)	-.19 (.43)	.81 (1.26)
C.A.C.T.	.34 (.05)**	.53 (.11)**	.32 (.05)**	.42 (.15)**
Age	.03 (.01)**	.09 (.04)*	.03 (.01)**	.03 (.03)
Posat	.06 (.03)*	-.04 (.07)	.11 (.03)**	-.04 (.09)
Rtuce	-.78 (.68)	-1.03 (2.37)	-.60 (.77)	-2.56 (2.52)
Constant	-7.20 (NA)	-18.97 (NA)	-7.66 (NA)	-6.15 (NA)
$\bar{R}^2$	.50	.52	.49	.49
F	40.93**	6.76**	28.91**	6.21**
SSE	4729	522	3276	668
n	400	55	289	56
F Test	F = 1.96** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

Disaggregation by the Student's Age

When the sample is divided into two age groups, those twenty years of age and under and those over twenty years of age, none of the models indicates a significant difference in the sets of coefficients (F=1.02). Apparently the age of the student as used in this study has no influence on achievement.

TABLE SIX

Conclusions

A sample of college students enrolled in a principles of economics course was disaggregated on the basis of sex, preTUCE, CACT, pre-attitude and age. While, the individual regression estimates for these subgroups seem to indicate that the coefficients of the production functions are different only the disaggregations by preTUCE and CACT are consistently statistically significant for all models when submitted to an F test.

The disaggregation by preTUCE (previous knowledge of the subject) indicates that the teacher variables have a different influence on the low, average, and high preTUCE students. Similar results are attained when the sample is disaggregated by CACT score. One model indicates that disaggregation by the student's pre-attitude towards economics may be important for those student's with poor or low attitudes toward economics.

TABLE SIX

Comparisons by Age of Student
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	Total Sample (2)	Age (Less than 20 years) (3)	Age (Greater than 20 years) (4)
PreTUCE	.21 (.06)**	.23 (.06)**	.18 (.06)**	.45 (.16)**
Posexgr	1.55 (.30)**	1.75 (.29)**	1.81 (.31)**	1.09 (.89)
Teacher1	3.47 (.52)**	3.52 (.52)**	3.55 (.54)**	5.00 (2.37)*
Teacher2	1.48 (.57)*	1.56 (.57)**	1.65 (.60)**	1.51 (2.20)
Teacher3	3.97 (.70)**	3.93 (.71)**	4.10 (.72)**	3.06 (1.12)**
Sex	.02 (.38)	-.08 (.38)	-.32 (.41)	1.84 (1.21)
C.A.C.T.	.34 (.05)**	.32 (.04)**	.34 (.05)**	.24 (.13)*
Age	.03 (.01)**	--	--	--
Posat	.06 (.03)*	.06 (.03)*	.06 (.03)*	-.02 (.08)
Rtuce	.78 (.68)	-.48 (.68)	-.87 (.77)	-.99 (2.14)
Constant	-7.20 (NA)	-1.03 (NA)	-1.25 (NA)	3.75 (NA)
$\bar{R}^2$	.50	.49	.50	.44
F	40.93**	43.16**	38.73**	5.39**
SSE	4729	4862	4107	611
n	400	400	348	52

F Test F = 1.02 (The coefficient are not significantly different)

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

The disaggregations by the student's sex and age were not significant. This research suggests that separating students into classes by ability and previous knowledge of the subject with the "proper" teachers might enhance their learning in principles of economics.

THE SAMPLE

Three samples are combined for this research. One is a large lecture class at a large state university in the Midwest. This sample consists of a subset of 185 students with complete data out of class of about 400 students. The characteristics of the subset and the total class were compared and they appeared to be similar. The second sample consists of several small sections taught by three different instructors at a small private university in the Midwest. A total of 149 students from an original enrollment of approximately 200 are included in this group. The third sample consists of two small sections taught by Teacher2 at a medium size state university in the South. This sample totaled 66 students from an original enrollment of 139 students. Due to a lack of data, it was impossible to compare the latter two samples to their original enrollment groups. A table of means and standard deviations is included as appendix A.

THE LEARNING MODEL

The model used for this research, developed by Manahan (1980) is as follows:[3]

Achievement = f(ability, attitude, effort, quality of instruction, socioeconomic variables)

Achievement is measured by the Test of Understanding College Economics (TUCE). Two of the samples were tested with the original TUCE and one sample was tested with the revised TUCE. A dummy variable (Rtuce) was introduced in an attempt to control for this difference. However, the dummy variable also corresponds perfectly with one sample and thus measures any unaccounted for differences occurring between that sample and the other two samples.

Attitude toward economics as a subject is measured by the attitude survey developed by Hodgin and Manahan (1978). Both the change in the student's attitude towards economics (post-attitude - pre-attitude) and the student's post-attitude measured during the last week of class are used in separate models. The change in attitude variable explains slightly more, i.e. adjusted R^2's are slightly higher for the models using the change in attitude.

The student's expected grade (Posexgr) solicited near the end of the course is used as a measure of effort. This variable was suggested by Wetzel (1977). Wetzel defined effort as the gain in knowledge divided by ability or

$$\text{Effort} = \frac{\text{PostTUCE} - \text{PreTUCE}}{\text{A.C.T. or S.A.T.Score}}$$

Since this variable cannot be used in an equation that has some form of postTUCE as the dependent variable, Wetzel

estimated effort and found that the best variable for estimating effort was the student's expected grade, thus following Wetzel, Posexgr is used as a proxy for effort.

Dummy variables for the different teachers are used to measure the differences in the quality of instruction. The student's age and sex are also included as suggested by some earlier research despite recent research demonstrating their ineffectiveness (Manahan 1984).

The empirical versions of the model are as follows:

$$\begin{matrix}\text{PostTUCE} \\ \text{TUCEchg} \\ \text{TUCEgap}\end{matrix} = b_0 + b_1\ \text{PreTUCE} + b_2\ \text{Posexgr} + b_3\ \text{Teacher 1} + b_4\ \text{Teacher 2} + b_5\ \text{Teacher 3} + b_6\ \text{Sex} + b_7\ \text{CACT} + b_8\ \text{Age} + b_9\ \underset{\text{(Posat)}}{\text{Attchg}} + b_{10}\ \text{Rtuce} + e$$

where:

PostTUCE = student's score on the Test of Understanding College Economics (TUCE) at the end of the course

PreTUCE = student's score on the TUCE at the beginning of the course

Rtuce = dummy variable for those students taking the revised TUCE. Rtuce also corresponds perfectly with one sample and thus explains all unaccounted for differences between this sample and the other two samples.

Posexgr = student's expected grade in the economics course near the end of the course

Teacher 1
Teacher 2 = dummy variables for different teachers
Teacher 3

Teacher 4 = the omitted teacher dummy variable, which also corresponds perfectly with the large section sample and thus covers all unexplained differences due to this sample.

Sex = student's sex 1=male; 0=female

CACT = student's composite American College Test (ACT) Score

Age = student's age in months

Posat = student's score on the attitude survey near the end of the course.

Atchg = student's attitude toward economics at the end of the course minus the students attitude at the beginning of the course. Used in the model in appendices C, D and E.

TUCEchg = PostTUCE minus PreTUCE. Used as the dependent variable in the model in appendix D.

TUCEgap = $\frac{\text{PostTUCE - PreTUCE}}{\text{perfect score - PreTUCE}}$

Used as the dependent variable in the model in appendix E.

THE HYPOTHESES

It is hypothesized that PreTUCE, Posexgr, CACT, Age, Atchg and being male (sex) will have positive influences on achievement as measured by PostTUCE thus a one tailed student t test is utilized. The influences of Teacher 1, Teacher 2, Teacher 3, and Rtuce cannot be predicted a priori thus a two tailed t test is used. An F test developed by Chow (1960) is utilized to test for differences in the estimated coefficients of the production function for the various subgroups.[1] The hypothesis for the F test is that the estimated coefficients of the equations are the same. A t test is used to test for the difference between the coefficients of two disaggregated regressions. The hypothesis for the t test is that $b_1=b_2$.[2]

FOOTNOTES

[1] The equations for the F test utilized in this research are as follows:

$$F = \frac{Q3/K}{Q2/(N_1 + N_2 - 2K)}$$

$$Q_2 = SSE_1 + SSE_2$$

$$Q_3 = SSE_t - Q_2$$

$$F = \frac{Q3/K}{Q_2/(N_1 + N_2 + N_3 - 3K)}$$

$$Q_2 = SSE_1 + SSE_2 + SSE_3$$

$$Q_3 = SSE_t - Q_2$$

[2] The equation for the t test used to test the hypothesis $b_1 = b_2$ is as follows:

$$t = \frac{(b_1 - b_2)}{\sqrt{\text{var } b_1 + \text{var } b_2}} = \frac{(b_1 - b_2)}{\sqrt{(\text{std error } b_1)^2 + (\text{std error } b_2)^2}}$$

degrees of freedom

$$df = n_1 - (k_1 + 1) + n_2 - (k_2 + 1)$$

[3] The possible simultaneity between student achievement and student attitude toward economics has been ignored due the difficulty of running TSLSQ on version H, release 8.1 of SPSS for all of the equations utilized.

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APPENDIX A
MEANS AND STANDARD DEVIATIONS

Variable	Total Sample		University One		University Two		University Three	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Preat	48.33	5.54	48.00	5.57	48.44	5.31	49.00	6.02
PreTUCE	10.82	3.29	11.20	3.47	10.69	3.13	10.04	3.04
Posexgr	3.37	.80	3.50	.82	3.31	.79	3.14	.72
Teacher1	.17	.38	-	-	.46	.50	-	-
Teacher2	.29	.45	-	-	.34	.47	1.0	-
Teacher3	.08	.26	-	-	.20	.40	-	-
Sex	.61	.49	.58	.59	.67	.47	.56	.50
CACT	20.26	4.92	20.33	4.92	21.40	4.51	17.49	4.80
Age	230.37	21.62	228.86	20.60	227.36	19.13	241.39	26.17
Posat	45.62	8.10	44.23	7.89	46.99	8.09	46.41	8.20
PostTUCE	17.56	4.93	16.55	4.08	19.52	5.32	15.94	4.83
Rtuce	.16	.37	-	-	-	-	1.0	-
Atchg	-2.71	7.48	-3.77	7.75	-1.44	7.49	-2.59	6.16
TUCEchg	6.74	4.79	5.35	4.31	8.83	4.64	5.89	4.77
TUCEgap	.31	.23	.24	.19	.40	.23	.29	.24
Pertchg	.73	.61	.59	.61	.91	.58	.68	.58
n	400		185		149		66	

APPENDIX B
ZERO ORDER CORRELATION COEFFICIENTS

	Preat	PreTUCE	Posexgr	Teacher1	Teacher2	Teacher3	Sex	CACT	Age	Posat	PostTUCE	Atchg	TUCEchg	TUCEgap
Preat	1.0													
PreTUCE	.12	1.0												
Posexgr	.18	.39	1.0											
Teacher1	.06	-.02	-.08	1.0										
Teacher2	.03	-.08	-.11	.29	1.0									
Teacher3	-.03	-.04	.01	-.13	-.18	1.0								
Sex	.12	.16	.13	.04	-.03	.11	1.0							
CACT	.12	.36	.48	.14	-.12	.02	.20	1.0						
Age	.02	.09	.17	-.08	.17	-.06	-.08	-.11	1.0					
Posat	.45	.22	.45	.09	.08	.04	.25	.22	.11	1.0				
PostTUCE	.10	.38	.51	.23	-.07	.15	.17	.55	.13	.36	1.0			
Rtuce	.05	-.10	-.13	-.20	.70	-.13	-.05	-.25	.23	.04	-.15			
Atchg	-.25	.15	.35	.05	.06	.06	.18	.15	.10	.75	.32	1.0		
TUCEchg	.21	-.30	.26	.25	-.02	.18	.07	.32	.07	.22	.77	.23	1.0	
TUCEgap	.05	-.12	.34	.24	.04	.14	.09	.39	.13	.29	.85	.27	.96	1.0
Pertchg	-.02	-.56	.06	.19	-.01	.14	.01	.12	.04	.10	.47	.12	.87	.74

APPENDIX C

TABLE ONE

Comparison of Three Subsamples

Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	University One (2)	University Two (3)	University Three (4)
PreTUCE	.18 (.06)**	.16 (.08)*	.36 (.11)**	-.09 (.18)
Posexgr	1.16 (.30)**	1.15 (.03)**	2.19 (.54)**	1.38 (.71)*
Sex	.28 (.40)	.22 (.50)	.46 (.69)	-1.33 (.98)
CACT	.40 (.05)**	.30 (.06)**	.33 (.09)**	.55 (.12)**
Age	.03 (.01)**	.02 (.01)*	.02 (.02)	.06 (.02)**
Atchg	.10 (.03)**	.07 (.03)*	.07 (.05)	.09 (.08)
Constant	-2.50 (NA)	.86 (NA)	-4.00	-10.98 (NA)
$\bar{R}^2$	.43	.39	.51	.42
F	50.09**	20.18**	26.66**	8.68**
SSE	5499	1824	1967	807
n	400	185	149	66
F Test	F = 10.61** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE TWO

Comparison by Sex of Student
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	Total Sample (2)	Males (3)	Females (4)
PreTUCE	.21 .06**	.21 (.06)**	.20 (.07)**	.21 (.10)*
Posexgr	1.55 (.28)**	1.55 (.28)**	1.51 (.36)**	1.58 (.47)**
Teacher1	3.50 (.51)**	3.50 (.51)**	4.04 (.65)**	2.56 (.83)**
Teacher2	1.44 (.57)*	1.44 (.57)*	1.78 (.74)*	1.08 (.90)
Teacher3	3.92 (.69)**	3.93 (.69)**	3.71 (.80)**	4.59 (1.46)**
Sex	.04 (.37)	--	--	--
CACT	.35 (.04)**	.35 (.04)**	.32 (.06)**	.39 (.07)**
Age	.03 (.01)**	.03 (.01)**	.05 (.02)**	.02 (.01)*
Atchg	.07 (.03)*	.07 (.03)*	.05 (.03)*	.09 (.04)*
Rtuce	-.67 (.68)	-.67 (.68)	-1.87 (.94)**	.20 (1.04)
Constant	-4.54 (NA)	-4.51 (NA)	-9.24 (NA)	-3.67 (NA)
$\bar{R}^2$	.50	.51	.47	.52
F	41.51**	46.23**	24.49**	19.92**
SSE	4695	4695	2867	1729
n	400	400	244	156
F Test	F = .72 (The coefficients are not significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE THREE

Comparison by PreTUCE Scores
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	PreTUCE (Less than 8) (2)	PreTUCE (8 to 13) (3)	PreTUCE (Greater than 13) (4)
Posexgr	1.75 (.28)**	1.83 (.90)*	1.70 (.35)**	.69 (.53)
Teacher1	3.39 (.52)**	1.09 (1.34)	3.78 (.63)**	4.38 (1.04)**
Teacher2	1.33 (.57)*	-.89 (1.38)	1.15 (.73)	4.40 (1.02)**
Teacher3	3.76 (.70)**	2.12 (1.82)	4.36 (.83)**	1.91 (1.66)
Sex	.17 (.38)	-.73 (.92)	.23 (.46)	.01 (.78)
CACT	.38 (.04)**	.28 (.12)*	.33 (.06)**	.43 (.09)**
Age	.03 (.01)**	.03 (.05)	.03 (.01)**	.04 (.01)**
Atchg	.07 (.02)**	.12 (.07)*	.05 (.03)*	.13 (.06)*
Rtuce	-.67 (.69)	.04 (1.75)	.03 (.84)	-4.66 (1.49)**
Constant	-4.25 (NA)	11.88 (NA)	-3.62 (NA)	-1.91 (NA)
$\bar{R}^2$	.49	.35	.42	.70
F	43.39**	4.22**	23.20**	17.16**
SSE	4849	485	3558	349
n	400	55	282	63
F Test	F = 3.85**(The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE FOUR

Comparison by C.A.C.T. Scores
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	C.A.C.T. (Less than 16) (2)	C.A.C.T. (16 to 25) (3)	C.A.C.T. (Greater than 25) (4)
PreTUCE	.31 (.06)**	.16 (.16)	.20 (.08)**	.46 (.12)**
Posexgr	2.50 (.40)**	2.27 (.64)**	1.52 (.38)**	2.05 (.61)**
Teacher1	4.26 (.54)**	1.22 (1.87)	4.04 (.63)**	3.61 (1.05)**
Teacher2	2.15 (.60)**	1.60 (2.15)	.56 (.72)	4.15 (1.08)**
Teacher3	3.87 (.74)**	2.23 (1.44)	5.01 (.91)**	2.60 (1.74)
Sex	.38 (.39)	.35 (.90)	.22 (.48)	-1.09 (.93)
Age	.02 (.01)*	.06 (.02)**	.02 (.01)*	.02 (.02)
Atchg	.06 (.03)*	.05 (.07)	.07 (.03)*	.04 (.06)
Rtuce	-1.75 (.71)**	-2.42 (2.21)	.42 (.86)	-5.12 (1.82)**
Constant	.60 (NA)	-9.98 (NA)	4.79 (NA)	1.72 (NA)
$\bar{R}^2$	.43	.32	.30	.52
F	34.09**	4.55**	13.98**	8.31**
SSE	5432	693	3424	472
n	400	70	269	61
F Test	F = 6.85**(The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE FIVE

Comparison by Pre-attitude Scores
Dependent Variable = PostTUCE

Independent Variables	Total Sample (1)	Pre-attitude (Less than 43) (2)	Pre-attitude (43 to 54) (3)	Pre-attitude (Greater than 54) (4)
PreTUCE	.22	-.09	.27	.22
	(.06)**	(.15)	(.07)**	(.16)
Posexgr	1.80	1.66	1.71	1.70
	(.27)**	(.77)**	(.33)**	(.77)*
Teacher1	3.70	3.12	4.27	2.05
	(.51)**	(1.49)*	(.61)**	(1.43)
Teacher2	1.66	1.39	1.71	2.84
	(.57)**	(2.15)	(.63)**	(2.12)
Teacher3	4.10	4.12	4.34	4.37
	(.70)**	(1.61)*	(.85)**	(2.12)*
Sex	.19	.71	.10	.80
	(.37)	(1.05)	(.43)	(1.25)
C.A.C.T.	.34	.53	.30	.44
	(.05)**	(.11)**	(.05)**	(.15)**
Age	.03	.09	.03	.03
	(.01)**	(.04)*	(.01)**	(.03)
Rtuce	-.75	-.92	-.51	-2.45
	(.68)	(2.34)	(.78)	(2.48)
Constant	-5.84	-20.15	-4.95	-7.59
	(NA)	(NA)	(NA)	(NA)
$\bar{R}^2$	.50	.52	.48	.50
F	44.56**	7.61**	29.92**	7.00**
SSE	4785	525	3402	671
n	400	55	289	56
F Test	F = 1.51 (The coefficients are not significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE SIX

Comparisons by Age of Student
Dependent Variable = PostTUCE

Independent Variables	Total Sample (2)	Age (Less than 20 years) (3)	Age (Greater than 20 years) (4)
PreTUCE	.23 (.06)**	.19 (.07)**	.44 (.16)**
Posexgr	1.75 (.28)**	1.82 (.30)**	.98 (.82)
Teacher1	3.54 (.52)**	3.56 (.53)**	4.88 (2.30)*
Teacher2	1.51 (.57)*	1.58 (.60)**	1.57 (2.23)
Teacher3	3.87 (.70)**	4.04 (.72)**	2.97 (2.88)
Sex	.06 (.37)	-.30 (.40)	1.69 (1.14)
C.A.C.T.	.32 (.04)**	.34 (.05)**	.24 (.13)*
Atchg	.08 (.03)**	.07 (.03)*	.03 (.10)
Rtuce	-.38 (.68)	-.77 (.77)	-1.03 (2.15)
Constant	1.61 (NA)	1.47 (NA)	3.49 (NA)
$\bar{R}^2$	.49	.50	.44
F	43.86**	39.22**	5.40**
SSE	4823	4081	611
n	400	348	52
F Test	F = 1.06 (The coefficients are not significantly different)		

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

APPENDIX D

TABLE ONE

Comparison of Three Subsamples

Dependent Variable = TUCEchg

Independent Variables	Total Sample (1)	University One (2)	University Two (3)	University Three (4)
Posexgr	.30	.33	1.35	1.08
	(.34)	(.48)	(.57)*	(.89)
Sex	-.19	-.49	.00	-.70
	(.47)	(.65)	(.75)	(1.23)
CACT	.28	.18	.27	.20
	(.05)**	(.07)**	(.09)**	(.13)
Age	-.02	.01	.01	.04
	(.01)	(.01)	(.02)	(.02)
Atchg	.10	.07	.06	.02
	(.03)**	(.04)	(.05)	(.10)
Constant	-3.42	-.85	-4.42	-9.05
	(NA)	(NA)	(NA)	(NA)
$\bar{R}^2$	.13	.06	.22	.05
F	13.34	3.30**	9.11**	1.70
SSE	7829	3133	2421	1294
n	400	185	149	66
F Test	F = 9.12** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE TWO

Comparison by Sex of Student
Dependent Variable = TUCEchg

Independent Variables	Total Sample (1)	Total Sample (2)	Males (3)	Females (4)
Posexgr	.81 (.33)**	.80 (.33)*	.64 (.43)	1.08 (.55)*
Teacher1	3.88 (.61)**	3.87 (.61)**	4.21 (.79)**	3.29 (.97)**
Teacher2	1.84 (.68)**	1.84 (.68)**	2.44 (.90)**	1.17 (1.05)
Teacher3	4.51 (.83)**	4.22 (.83)**	4.41 (.98)**	5.20 (1.72)**
Sex	-.44 (.45)	--	--	--
CACT	.22 (.05)**	.21 (.05)**	.17 (.07)**	.28 (.08)**
Age	.02 (.01)*	.02 (.01)*	.03 (.02)	.01 (.01)
Atchg	.06 (.03)*	.06 (.03)*	.04 (.04)	.08 (.05)*
Rtuce	-.68 (.82)	-.70 (.82)	-1.69 (1.15)	.21 (1.22)
Constant	-5.62 (NA)	-5.91 (NA)	-7.31 (NA)	-6.35 (NA)
$\bar{R}^2$	.24	.24	.19	.30
F	14.89**	16.62**	8.13**	9.22**
SSE	6813	6830	4310	2403
n	400	400	244	156
F Test	F = .72 (The coefficients are not significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE THREE

Comparison by PreTUCE Scores
Dependent Variable = TUCEchg

Independent Variables	Total Sample (1)	PreTUCE (Less than 8) (2)	PreTUCE (8 to 13) (3)	PreTUCE (Greater than 13) (4)
Posexgr	.81 (.33)**	1.24 (.96)	1.33 (.38)**	.02 (.70)
Teacher1	3.88 (.61)**	.80 (1.43)	3.76 (.68)**	5.41 (1.36)**
Teacher2	1.84 (.68)**	-1.11 (1.47)	1.00 (.79)	5.12 (1.34)**
Teacher3	4.51 (.83)**	1.94 (1.94)	4.67 (.90)**	1.81 (2.17)
Sex	-.44 (.45)	-.63 (.98)	.01 (.50)	-.75 (1.03)
CACT	.22 (.05)**	.28 (.13)*	.28 (.06)**	.39 (.11)**
Age	.02 (.01)*	-.00 (.05)	.03 (.01)**	.00 (.02)
Atchg	.06 (.03)*	.13 (.07)*	.04 (.03)	.14 (.09)
Rtuce	-.68 (.82)	-.15 (1.86)	.27 (.91)	-4.18 (1.95)
Constant	-5.62 (NA)	1.70 (NA)	-11.06 (NA)	-7.89 (NA)
$\bar{R}^2$	.24	.28	.32	.52
F	14.89**	3.30**	15.35**	8.50
SSE	6813	547	4153	596
n	400	55	282	63
F Test	F = 10.59** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE FOUR

Comparison by C.A.C.T. Scores
Dependent Variable = TUCEchg

Independent Variables	Total Sample (1)	C.A.C.T. (Less than 16) (2)	C.A.C.T. (16 to 25) (3)	C.A.C.T. (Greater than 25) (4)
Posexgr	1.50	2.30	.42	1.61
	(.30)**	(.77)**	(.43)	(.70)*
Teacher1	4.36	1.38	3.95	4.75
	(.45)**	(2.24)	(.74)**	(1.19)**
Teacher2	2.28	2.89	1.24	3.78
	(.69)**	(2.56)	(.84)	(1.26)**
Teacher3	4.43	1.59	6.02	3.33
	(.85)**	(1.73)	(1.07)**	(2.01)
Sex	-.17	.22	-.43	-1.77
	(.45)	(1.08)	(.56)	(1.07)
Age	.01	.06	.00	.02
	(.01)	(.03)*	(.01)	(.03)
Atchg	.05	-.03	.10	-.05
	(.03)*	(.08)	(.03)**	(.07)
Rtuce	-1.39	-2.60	.11	-5.33
	(.82)	(2.65)	(1.01)	(2.12)
Constant	-2.10	-17.32	3.18	-3.73
	(NA)	(NA)	(NA)	(NA)
$\bar{R}^2$	.21	.13	.19	.31
F	13.90**	2.34*	8.69**	4.35**
SSE	7127	1016	4763	650
n	400	70	269	61

F Test F = 4.50** (The coefficients are significantly different)

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE FIVE

Comparison by Pre-attitude Scores
Dependent Variable = TUCEchg

Independent Variables	Total Sample (1)	Pre-attitude (Less than 43) (2)	Pre-attitude (43 to 54) (3)	Pre-attitude (Greater than 54) (4)
Posexgr	1.04	1.47	.99	1.17
	(.32)**	(1.13)	(.37)**	(.94)
Teacher1	4.07	3.07	4.70	2.91
	(.61)**	(2.19)	(.69)**	(1.74)
Teacher2	2.05	-.50	2.38	.62
	(.68)**	(3.13)	(.72)**	(2.54)
Teacher3	4.68	1.90	5.32	5.36
	(.83)**	(2.33)	(.95)**	(2.59)*
Sex	-.30	.00	-.17	-.92
	(.44)	(1.53)	(.49)	(1.48)
C.A.C.T.	.22	.26	.19	.36
	(.05)**	(.16)*	(.06)**	(.18)*
Age	.02	.06	.03	-.03
	(.01)*	(.05)	(.01)*	(.03)
Rtuce	-.75	1.21	-.98	1.28
	(.82)	(3.41)	(.90)	(2.90)
Constant	-6.81	-18.68	-7.90	.19
	(NA)	(NA)	(NA)	(NA)
$\bar{R}^2$	.23	.08	.26	.15
F	16.07**	1.58	13.86**	2.17
SSE	6889	1161	4478	1032
n	400	55	289	56

F Test F = 1.35 (The coefficients are not significantly different)

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE SIX

Comparisons by Age of Student
Dependent Variable = TUCEchg

Independent Variables	Total Sample (2)	Age (Less than 20 years) (3)	Age (Greater than 20 years) (4)
Posexgr	.95 (.33)**	1.10 (.36)**	.08 (.88)
Teacher1	3.90 (.61)**	3.90 (.64)**	5.83 (2.56)*
Teacher2	1.88 (.68)**	1.86 (.72)*	2.78 (2.48)
Teacher3	4.47 (.84)**	4.72 (.87)**	3.10 (3.24)
Sex	-.50 (.45)	-.85 (.49)	1.55 (1.28)
C.A.C.T.	.21 (.05)**	.22 (.06)**	.13 (.14)
Atchg	.07 (.03)*	.07 (.03)*	.03 (.11)
Rtuce	-.48 (.81)	-.67 (.92)	-1.86 (2.40)
Constant	-1.63 (NA)	-2.29 (NA)	2.28 (NA)
$\bar{R}^2$	.23	.25	.06
F	16.29**	17.53**	1.39
SSE	6866	5941	791
n	400	348	52
F Test	F = .85 (The coefficients are not significantly different)		

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

APPENDIX E

TABLE ONE

Comparison of Three Subsamples
Dependent Variable = TUCEgap

Independent Variables	Total Sample (1)	University One (2)	University Two (3)	University Three (4)
Posexgr	.029 (.015)*	.030 (.021)	.083 (.025)**	.070 (.041)*
Sex	-.008 (.021)	-.023 (.028)	.005 (.033)	-.045 (.057)
CACT	.015 (.002)**	.009 (.003)**	.016 (.004)**	.016 (.006)*
Age	.001 (.000)**	.000 (.000)	.001 (.001)	.003 (.001)*
Atchg	.005 (.001)**	.004 (.002)*	.003 (.002)	.002 (.004)
Constant	-.379 (NA)	-.73 (NA)	-.510 (NA)	-.82 (NA)
$\bar{R}^2$	.215	.12	.35	.21
F	22.85**	6.07**	16.91**	4.43**
SSE	15.74	5.72	4.77	2.73
n	400	185	149	66
F Test	F = 12.14**(The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE TWO

Comparison by Sex of Student
Dependent Variable = TUCEgap

Independent Variables	Total Sample (1)	Total Sample (2)	Males (3)	Females (4)
Posexgr	.055 (.015)**	.055 (.015)**	.050 (.020)*	.064 (.023)**
Teacher1	.184 (.027)**	.184 (.027)**	.213 (.036)**	.136 (.041)**
Teacher2	.102 (.030)**	.102 (.030)**	.125 (.041)**	.077 (.045)*
Teacher3	.191 (.037)**	.188 (.037)**	.183 (.044)**	.247 (.073)**
Sex	-.018 (.020)	--	--	--
CACT	.013 (.002)**	.013 (.002)**	.011 (.003)**	.015 (.003)**
Age	.001 (.000)*	.001 (.000)*	.002 (.001)*	.001 (.001)
Atchg	.003 (.001)*	.003 (.001)*	.002 (.002)	.004 (.002)*
Rtuce	-.007 (.036)	-.008 (.036)	-.050 (.052)	.022 (.052)
Constant	-.47 (NA)	-.48 (NA)	-.64 (NA)	-.45 (NA)
$\bar{R}^2$	.32	.32	.26	.39
F	21.49**	24.08**	11.77**	13.50**
SSE	13.57	13.60	9.02	4.34
n	400	400	244	156
F Test	F = .75(The coefficients are not significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE THREE

Comparison by PreTUCE Scores
Dependent Variable = TUCEgap

Independent Variables	Total Sample (1)	PreTUCE (Less than 8) (2)	PreTUCE (8 to 13) (3)	PreTUCE (Greater than 13) (4)
Posexgr	.055 (.015)**	.053 (.036)	.070 (.017)**	.002 (.041)
Teacher1	.184 (.027)**	.033 (.054)	.173 (.030)**	.314 (.081)**
Teacher2	.102 (.031)**	-.032 (.055)	.051 (.036)	.295 (.080)**
Teacher3	.192 (.037)**	.077 (.073)	.207 (.041)**	-.170 (.129)
Sex	-.108 (020)	-.028 (.037)**	.000 (.022)	-.043 (.061)
CACT	.013 (.002)**	.010 (.005)*	.013 (.003)**	.028 (.007)**
Age	.001 (.000)**	-.000 (.002)	.001 (.000)*	.001 (.001)
Atchg	.003 (.001)*	.005 (.003)*	.002 (.001)	.011 (.005)*
Rtuce	-.007 (.036)	.026 (.070)	.040 (.041)	-.170 (.116)
Constant	-.47 (NA)	.12 (NA)	-.57 (NA)	-.73 (NA)
$\bar{R}^2$	.32	.25	.37	.58
F	21.49**	3.01**	16.86**	10.33**
SSE	13.58	0.77	8.44	2.11
n	400	55	282	63
F Test	F = 7.39** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE FOUR

Comparison by C.A.C.T. Scores
Dependent Variable = TUCEgap

Independent Variables	Total Sample (1)	C.A.C.T. (Less than 16) (2)	C.A.C.T. (16 to 25) (3)	C.A.C.T. (Greater than 25) (4)
Posexgr	.095 (.014)**	.106 (.036)**	.043 (.019)*	.097 (.034)**
Teacher1	.212 (.028)**	.070 (.103)	.197 (.033)**	.211 (.058)**
Teacher2	.128 (.031)**	.155 (.119)	.059 (.037)	.245 (.061)**
Teacher3	.187 (.039)**	.020 (.080)	.265 (.047)**	.164 (.098)
Sex	-.003 (.020)	.008 (.050)	.015 (.025)	-.060 (.052)
Age	.001 (.000)	.003 (.001)**	.001 (.000)	.002 (.001)
Atchg	.003 (.001)*	-.001 (.004)	.005 (.001)**	.001 (.003)
Rtuce	-.049 (.037)	-.128 (.122)	.044 (.044)	-.202 (1.030)
Constant	-.27 (NA)	-.89 (NA)	-.02 (NA)	-.49 (NA)
$\bar{R}^2$	.27	.16	.23	.36
F	19.00**	2.62*	10.83**	5.28**
SSE	14.62	2.17	9.26	1.53
n	400	70	269	61
F Test	F = 5.31** (The coefficients are significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE FIVE

Comparison by Pre-attitude Scores
Dependent Variable = TUCEgap

Independent Variables	Total Sample (1)	Pre-attitude (Less than 43) (2)	Pre-attitude (43 to 54) (3)	Pre-attitude (Greater than 54) (4)
Posexgr	.067 (.014)**	.077 (.052)	.064 (.016)**	.793 (.044)*
Teacher1	.194 (.027)**	.169 (.101)	.216 (.030)**	.161 (.081)**
Teacher2	.113 (.030)**	.048 (.146)	.110 (.031)**	.179 (.118)
Teacher3	.200 (.037)**	.062 (.108)	.230 (.042)**	.258 (.121)**
Sex	-.011 (.020)	.000 (.071)	.006 (.022)	-.026 (.069)
C.A.C.T.	.013 (.002)**	.017 (.007)*	.011 (.002)**	.016 (.008)*
Age	.001 (.000)**	.004 (.002)	.001 (.000)**	-.000 (.001)
Rtuce	-.011 (.037)	.019 (.158)	.001 (.039)	-.063 (.135)
Constant	-.53 (NA)	-1.28 (NA)	-.53 (NA)	-.29 (NA)
$\bar{R}^2$	.31	.18	.33	.24
F	23.15**	2.43*	18.99**	3.22**
SSE	13.78	2.50	8.57	2.24
n	400	55	289	56
F Test	F = 1.46 (The coefficients are not significantly different)			

standard errors in parenthesis
* significant at p = .05
** significant at p = .01

TABLE SIX

Comparisons by Age of Student
Dependent Variable = TUCEgap

Independent Variables	Total Sample (1)	Age (Less than 20 years) (3)	Age (Greater than 20 years) (4)
Posexgr	064 (.015)**	.704 (.016)**	.027 (.043)
Teacher1	.186 (.028)**	.185 (.028)**	.279 (.126)*
Teacher2	.105 (.031)**	.107 (.032)**	.129 (.122)
Teacher3	.189 (.037)**	.197 (.038)**	.166 (.159)
Sex	-.022 (.020)	-.038 (.021)*	.075 (.063)
C.A.C.T.	.012 (.002)**	.012 (.003)**	.011 (.007)
Atchg	.003 (.001)**	.003 (.001)*	.002 (.005)
Rtuce	.005 (.036)	-.014 (.041)	-.020 (.118)
Constant	-.21 (NA)	-.22 (NA)	-.09 (NA)
$\bar{R}^2$	.31	.32	.13
F	23.02**	21.73**	1.98
SSE	13.81	11.62	1.92
n	400	348	52
F Test	F = .84 (The coefficients are not significantly different)		

standard errors in parenthesis
* significant at p = .05
** significant at p = .01